AIDS Education and Prevention, 12, Supplement A, 21–32, 2000

Strengthening HIV Prevention: Application of a Research-to-Practice Framework

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As the HIV epidemic continues to affect at-risk and vulnerable populations, providers strive to improve prevention programs, in part by seeking new interventions with greater effects. Although interventions with scientific evidence of effectiveness are vital to this effort, many challenges limit access to research products. We examine key challenges and offer a framework for moving research to practice, one in which research steps are linked to practice steps and all these activities take place in a complex and dynamic environment. The Replicating Effective Programs (REP) project of the Centers for Disease Control and Prevention and other technology transfer activities illustrate the operation of this framework for HIV prevention. Further actions to improve technology transfer are called for. These include reducing time from study design to practice; learning from field-based implementations; providing guidance about fidelity to, and tailoring of, science-based interventions; improving linkages among consumers, providers, and researchers; and seeking additional resources.

Approximately 40,000 new HIV infections occur each year in the United States. Despite many years of prevention effort, this number remains stable as a result of HIV disease continuing in some populations and emerging in others (Centers for Disease Control and Prevention [CDC], 1999). In this context, HIV prevention service providers seek not only to improve existing programs but also to offer new state-of-the-science interventions that can have a greater effect. However, the road from HIV intervention research to the practice of science-based HIV prevention is often long and arduous.

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The authors acknowledge the contributions of Robert Kohmescher, whose support for bridging research and practice has been critical to many of the technology transfer activities described in this article. They also thank Pat Thomas for her expert contributions to the graphic representations of the framework used here and in CDC slides.

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One reason for the difficult transition from HIV prevention research to practice is that researchers and providers may have different views about when new interventions are ready for use. Although both may agree that the goals of research are to broaden understanding of risk behaviors and improve the effectiveness of prevention interventions, their expectations about meeting these goals may differ. Researchers may focus on designing rigorous studies and gathering data for quantitative analyses. Their priority may be to continue a study until they can explain the risk behaviors or achieve a strong statistical result. On the other hand, service providers, who face the epidemic daily, may be ready to use new interventions as soon as there is some evidence of effectiveness in a population at risk.

Another challenge to efforts to move from research to practice is related to organizational structure (Blankenship, Bray, & Merson, 2000; Sumartojo, 2000). Organizations tend to develop practices that evolve into standard operating procedures and eventually are formalized in job descriptions and departmental structures. In smaller organizations, such as many community-based organizations (CBOs), change can be further impeded by the consuming need to maintain funding for service delivery. Administrative time is devoted to seeking funds rather than to finding new interventions. In addition, even a brief shortfall in funding can lead to layoffs that may include loss of the only staff members who are trained and experienced in delivering prevention interventions.

For those who want to move expeditiously from study results to the delivery of effective interventions, another challenge relates to the different paradigms and cultures of researchers and providers. Sometimes these differences are expressed as oversimplifications (e.g., researchers are interested only in publications; providers act on feelings, not facts). A lack of routine opportunities for information exchange among researchers and providers probably contributes to these perceptions and ongoing differences in the face of a common interest, HIV prevention.

Finally, the lack of access to information about science-based interventions can be an insurmountable barrier to providers who want to use science-based interventions. Although some interventions may have feasibility limitations, such as high cost or complex implementation, many science-based interventions are useable—if they are made available. However, research studies are typically published in many different scientific journals that are not subscribed to by provider audiences. Furthermore, scientific journals devote little space to describing interventions or how they were conducted, essential information for adoption and use.

Beginning in 1996, the CDC developed a working model or framework to move HIV prevention research to practice. This framework represents our experiences in technology transfer with HIV behavioral and social prevention interventions. Still, it remains a work in progress, a guide rather than a map. A companion article in this issue focuses on community level perspectives (Kraft, Mezoff, Sogolow, Neumann, & Thomas, 2000). A glossary is provided in this issue to suggest standard uses for the terms specific to technology transfer.

The following sections highlight three topics. The first is a research-to-practice framework designed to reduce barriers to and facilitate supports for moving from intervention research to science-based practice. The second topic is an application of the framework based on CDC's efforts to provide a range of activities that support science-based HIV prevention in the United States. Finally we note five areas where attention is needed to further research-to-practice goals and improve HIV prevention.

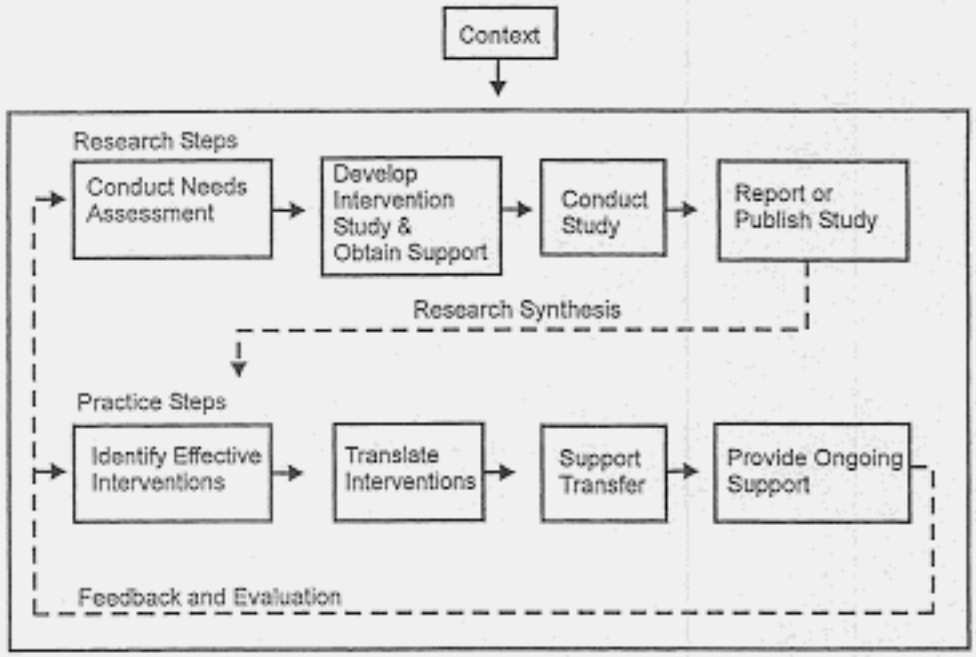

Figure 1. Research-to-Practice Framework for Technology Transfer

A FRAMEWORK FOR MOVING RESEARCH TO PRACTICE

The research-to-practice framework represents what we think are the critical elements needed to further evidence-based public health practice (Figure 1). These elements are (a) the context in which research and practice activities operate, (b) the sequence of steps involved in conducting research and the links from these research steps to practice, (c) the sequence of steps in prevention practice, and (d) feedback from practice experience to the design of future research and from practice experience to subsequent practice.

The context includes the biological, behavioral, social, cultural, and political events that influence all aspects of the framework. These events act as a dynamic set of forces that have various strengths and directions and may be positive, negative, or mixed. The context shapes what research will be designed and funded and which practices will be sanctioned or rejected. Thus, new findings regarding treatment, surveillance data, and actions by congressional committees and coalitions have the potential to influence public health.

Research steps typically proceed in a sequence—from conducting an assessment of research needs, to developing the study, obtaining support for the research, and carrying out the study, to reporting or publishing the results. Implementations of the research steps (e.g., level of participation of the consumer population in designing the needs assessment) will differ in part on the basis of contextual events (e.g., existence of mechanisms for researcher–consumer communications in the study community).

Furthermore, the research-to-practice framework depicts research synthesis as a necessary link between research products and prevention practices. Without a research

synthesis system—an ongoing, cumulative database of studies obtained by systematic review of the literature—prevention providers may require enormous resources to locate pertinent studies. For instance, providers might use a database (e.g., Medline, PsychLit, Sociofile) to search for studies. Depending on the search strategy, hundreds or even thousands of citations would be obtained. Scanning these citations, obtaining and reviewing the studies, and determining which studies are relevant and methodologically rigorous could be an insurmountable task. This link in the framework represents the need for a centralized mechanism to facilitate the systematic identification by trained coders following predetermined criteria of relevant and rigorous studies from all available intervention research.

Next, steps in the practice portion of the framework are designed to facilitate providers' access to and use of interventions that are determined to be effective. Ideally, once intervention research is conducted and identified as effective through the preceding steps, the practice steps begin with ready access to relevant information about effective interventions. The next step, translation, extends the information available from reports and publications to include descriptions of the intervention content and methods in sufficient detail that providers can use the new interventions in the field.

The last two steps in the practice sequence address the need for support to achieve the transfer of the intervention to practice, and then to sustain it. When a new intervention is adopted, administrators and staff may give it substantial attention and support through in-service orientations, staff reassignments, and the allocation of other organizational resources. After the initial implementation, however, problems that challenge the ability of the organization to sustain the intervention may emerge. These could range from short-term challenges, such as staff turnover, to major upheavals, such as competing priorities. Providing ongoing support, such as continued access to training and technical assistance, may make the intervention more sustainable.

Finally, a feedback and evaluation loop is included. Both subsequent implementation of the intervention and plans for future research can benefit from systematic observation and review of the current experience. Although it is convenient to depict the feedback loop as a final event, feedback actually occurs throughout the process. Throughout the process, the context also provides additional sources of feedback and influence. As a result, the intervention and strategies for implementation may be modified.

CDC'S HIV PREVENTION ACTIVITIES

As the nation's lead prevention agency, with research and program missions, CDC has a unique responsibility and ability to facilitate science-based prevention practice. In HIV prevention, CDC supports research to develop and evaluate new prevention interventions, a national community planning infrastructure in which health departments partner with community members to establish local priorities and plan strategies to reduce HIV transmission, and a system for providing training and technical assistance to state and community-based grantees. These activities reduce barriers to and facilitate support for science-based prevention (Figure 2).

The biological, behavioral, social, cultural, and political environment presents researchers and program providers with a set of forces that shape priorities and constrain actions. For instance, increased HIV/AIDS prevalence in specific regions of the country and in specific populations is one motivator for community planning groups to allocate HIV prevention resources. At the same time, variations in HIV prevalence across locales

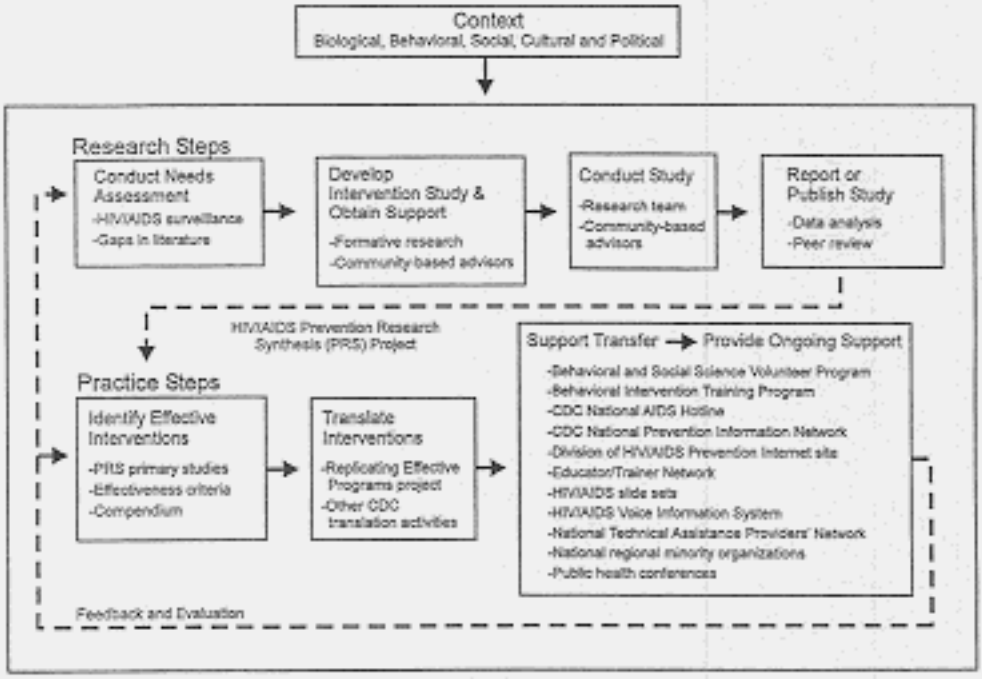

Figure 2. CDC Activities in a Research-to-Practice Framework for Technology Transfer

motivate researchers to design new interventions that address the social norms that influence behavior. Although CDC regards funding such studies as a high priority, scarce resources and allocations by Congress limit the number of studies that can be done.

Before initiating a new research study, CDC researchers conduct a needs assessment to determine, on the basis of HIV/AIDS surveillance and other data, the ways in which the literature does not adequately address specific populations, settings, or relevant risk behaviors. CDC researchers seek resources to fund requests for proposals (from external researchers) and cooperative agreements to carry out studies to fill these gaps.

Once funds are obtained, the study design and intervention content are developed. Formative research with consumers (e.g., focus groups, key participant interviews) and collaborative efforts with community boards may be used to examine selected topics more closely. At this point, however, researchers may have selected some directions, and community members may have limited influence. Once the study is underway, however, the research team may work closely with community-based advisors to design and carry out the study, which typically takes place over several years. Advisory panels may be asked to help guide the researchers on a range of issues (e.g., cultural sensitivity, ethical dilemmas). Thus, standard research practices include some mechanisms to support communication among researchers, providers, and consumers.

On the other hand, standard research practices can be constraining. For instance, research is usually considered complete when all postintervention and follow-up data are collected, analyzed, and reported. The final step in the research sequence is to write one

or more scientific papers (e.g., technical reports for funders, articles for peer review journals). Until recently, there has been no standard practice of communicating research results to prevention service providers.

The high volume of requests for science-based information was one reason CDC developed the Prevention Research Synthesis (PRS) project in 1996. PRS was designed to provide a cumulative database of all HIV prevention intervention research. This database will be used to help determine the factors that shape effectiveness, locate gaps in the research, and respond to other needs of researcher, provider, and consumer constituents. In addition, it is designed to provide the basis for systematic identification of effective interventions.

Using the PRS database and a set of criteria for relevance and methodologic rigor, CDC identified 126 primary studies (as of June 1998) (CDC, HIV/AIDS Prevention Research Synthesis Project, 1999). The use of relevance criteria (e.g., measurement of behavioral or biological outcomes) enabled PRS staff to select studies that focused on the reduction of HIV risk or transmission. The use of methodologic rigor criteria (e.g., the use of a control or comparison group) allowed selection of studies for which effects could be attributed to the intervention rather than to contemporaneous events. The acquisition of studies relied on both database and manual searches. When the PRS project staff complete the initial reviews of all studies in the pipeline (from 1988 forward), their focus will shift to conducting reviews of new studies to allow the PRS database to be as current as possible. Reports provided directly by investigators will support that goal.

CDC also developed effectiveness criteria so that studies with evidence of effectiveness could be identified from the primary studies (those that met criteria for relevance and methodologic rigor). Two reviewers examined eligible studies and selected those that met all criteria ($n = 24$ studies, as of June 1998; CDC, HIV/AIDS Prevention Research Synthesis Project, 1999). One-page summaries of the interventions were prepared for the 24 studies. These were presented with other related information (including specification of all criteria) in the *Compendium of HIV Prevention Interventions with Evidence of Effectiveness*. Annual updates of the PRS database (all studies), the primary studies (relevant and rigorous studies), and the compendium (relevant and rigorous studies with evidence of effectiveness) are planned.

CDC's Replicating Effective Programs (REP) project supports the translation of effective interventions, such as those identified in the compendium into materials suitable for use in local prevention programs (Neumann & Sogolow, 2000). At this time, 7 of the 24 effective interventions in the compendium are supported by REP (intervention packages are ready or in progress). Another 6 have received other translation support from CDC. Thus, about half of the 24 studies are, or soon will be, available for providers' consideration.

For the past 15 years, CDC has worked with its prevention partners throughout the country to develop many activities to support the final two practice steps: initial transfer and maintenance of the interventions. Selected resources, developed to support providers in health departments and CBOs, are are listed in the appendix and discussed in another article in this issue (Davis et al., 2000). Also, CDC researchers work with program and evaluation colleagues to strengthen and enhance the science base of such HIV prevention resources. Local providers, working with state health departments or CDC project officers, may use these resources to support the initial transfer of a science-based intervention or to sustain effective interventions. Taken together,

these funded activities constitute an important infrastructure that can be mobilized by communities to strengthen prevention programs.

RESEARCH-TO-PRACTICE ISSUES FOR FURTHER DEVELOPMENT

REDUCING TIME FROM RESEARCH TO PRACTICE

A decade can easily elapse between the time a research question is articulated and when materials are made available to consumers. A year or more is needed to develop a research proposal and obtain funding. A year is needed for formative research and several more to conduct the study. Another year or more is needed to analyze results and publish findings. An additional year may be needed to develop a proposal for funding translation and materials development. Although some researchers have developed extensive intervention materials as part of their study, 2 years are typically needed to carry out the translation tasks. In an environment without an epidemic, such time lines may be reasonable, but in HIV prevention research, this process is unacceptably slow.

One way to shorten this process would be for funding agencies to provide researchers who have successful interventions with noncompetitive awards to carry out translation activities. As soon as data analysis shows effectiveness, researchers would begin translation activities. This strategy would reduce reliance on the PRS project to identify relevant and rigorous studies for review and eliminate the need to compete for funds to use the REP project for translation support. It would make the link between research and practice more seamless and improve researcher–provider communications. Most important, it would save about 2 years in the research-to-practice time line. Other benefits may be increased attention by researchers to the documentation of studies and to the feasibility concerns of end users. Because noncompetitive awards can generate side effects, such as a tendency to inflate early findings, strategies will be needed to set conservative criteria for eligibility for translation funds. Criteria could include evaluating effectiveness of the implementation of the intervention and selection of the outcome measures that best reflect the effect of the intervention and preventing HIV transmission.

RECONSIDERING REPLICATION AND EFFECTIVENESS STUDIES

Generally, to conclude that the effects of an intervention are valid, researchers seek replications with similar successes. However, in HIV prevention research, several factors argue against requiring replications first. First, some studies have been replicated and have demonstrated consistent evidence of risk reduction and the absence of harm in other populations and settings. Second, many of the effective studies are similar to one another in important ways. Focusing on youth studies, reviewers such as Kirby and colleagues (1994) have examined prevention research studies and observed key elements of effectiveness, including the use of behavioral and social science theories in guiding intervention designs. The 1997 NIH Consensus Statement had similar findings for all HIV behavioral and social science prevention research (National Institutes of Health, 1997). Third, the context in which the interventions are carried out may be an important unexamined factor that shapes results (Eke, 2000; Holtgrave et al., 1995). Fourth, once there is nationwide access to effective interventions, some users may adopt intervention elements selectively. Local use may provide important settings for effectiveness trials, where significant new levels of understanding about interventions can emerge. Fifth, the benefits of further validation or replication research do not need to precede consumer access

to the information. As is true of other science-based practices (e.g., medicine), when further study yields new information, announcements should be made at the earliest possible time.

PROVIDING GUIDELINES FOR IMPLEMENTATION

A delicate balance is needed between implementing the intervention as designed and revising it to meet local needs. Researchers need to contribute to this process by providing their expert judgment about which elements need to be implemented "as is," which can be tailored to address the needs of local populations and settings, and which can be optional. Providers' expertise is needed to select the appropriate interventions for their programs and to determine strategies for tailoring that fit their situations. This complex issue is discussed in two articles in this issue (Kelly, Sogolow, and Neumann, 2000; Neumann & Sogolow, 2000).

Organizational and staff capability to implement the intervention needs to be considered. The more guidance that is provided about each aspect of selecting an intervention and implementation strategies, the less demand will be placed on senior staff for supervision or on junior staff for skills that may not be within their expertise. Trainers may be most directly involved as they help specific groups of end users learn the skills needed to select and use interventions. New resources to support the level of training appropriate to learning these interventions will be needed.

More broadly, CDC will need to provide guidance to health departments and CBOs in the preference for science-based interventions, expectations about implementation, strategies for observing and assessing the implementation, and resources to support effective delivery. Recently, in guidance provided for developing cooperative agreements and in evaluation training workshops for technical assistance providers, CDC has begun to take these steps.

IMPROVING LINKAGES AMONG CONSUMERS, PROVIDERS, RESEARCHERS, AND POLICYMAKERS

We increasingly expect prevention programs to use science-based strategies and effective interventions. To support these activities, mechanisms or linkages are needed to support communication and collaboration among consumers, providers, researchers and other behavioral and social scientists, and policymakers. Many HIV/AIDS consumer groups at local and national levels already have a strong record of influencing research agendas and directing resources to priority areas. Somewhat less developed but also noteworthy are instances of researcher–consumer collaboration. Examples mentioned earlier (advisory boards, local coalitions) have shaped many of the effective interventions that are described in this issue. However, communications are often episodic (e.g., limited to annual advisory board meetings), late (e.g., occurring after study designs have been established), or lacking. As we rely more on science-based interventions and strategies, it will be important to develop or enhance mechanisms for improved communication and collaboration.

It will not be enough just to continue the same approaches. It would not be feasible, for instance, for a small number of researchers, such as those who developed the interventions identified in the compendium, to work directly with hundreds of jurisdictions. Similarly, many community advisory board members commit considerable time to voluntary duties and could probably not give more.

Instead, new approaches should be sought. One mechanism with great potential for supporting communications is the newly developed REP+ website

(www.cdc.gov/hiv/projects/rep/default.htm). Additional information about this and other Web sites associated with translation and technology transfer is available through the National Prevention Information Network (www.cdc.gov/hiv/hivinfo/npin.htm). Because of easy access across fields, cultures, and time zones, webbased tools may stimulate thinking about new approaches to researcher-consumer communications. Another new approach is the Behavioral and Social Science Volunteers Program (BSSV), which is a nationwide mechanism for locating and linking researchers and scientists who volunteer in their own communities to facilitate the use of science-based interventions and strategies. A description of the role of BSSV linkages in the evaluation of prevention programs is included in this issue (Davis et al., 2000). As new or improved linkages in the HIV prevention community are developed, the relevance, focus, feasibility, and likelihood of using science-based products also may be strengthened.

SUPPORTING TRANSLATION, TRANSFER, AND SUSTAINABILITY OF SCIENCE-BASED INTERVENTIONS

Resources are needed to carry out current activities and proposed agendas. It may be useful to think of setting aside a proportion of existing prevention dollars for use in technology transfer. When we understand that translation, transfer, and sustainability of science-based interventions include a range of complex activities (materials development, orientation and training, community-based adoption and tailoring, technical assistance, feedback, and evaluation), the need for support is apparent. For some organizations, existing resources may be redirected, but for many others, new support will be needed.

In addition, the scientific study of technology transfer has been limited. Many questions remain unanswered: Which strategies support transfer? How do contextual factors influence results? How much is success a function of resource allocation? Answers to these questions can support more cost-saving and effective prevention.

CONCLUSIONS

CDC's development of a research-to-practice framework and its application to HIV prevention reflects a convergence of several factors. First, after 15 years of behavioral and social intervention research, there is a large body of scientific studies that can be systematically reviewed to identify interventions that meet effectiveness criteria. Second, the HIV epidemic in the United States has taken place in a social and political context of activism (earlier among gay men and more recently among people of color) that has demanded the use of science-based information. Third, CDC's combined missions of prevention and research, in a time of increased accountability for the sound use of scarce public health resources, provides a milieu for bringing these elements together.

Future efforts should (a) facilitate the rapid movement of new interventions to the intended users, (b) consider studies of intervention effectiveness that make use of field-based replications, (c) improve techniques to specify which aspects of the interventions are central (those that should be maintained with fidelity to the original research) and which aspects can be tailored for local use, (d) develop additional mechanisms or linkages to support ongoing communication and collaboration among those with common interests in intervention research and its implementation in practice, and (e) support translation and technology transfer activities that are needed to maintain state-of-the-science interventions and thereby strengthen HIV prevention programs.

APPENDIX
CDC Activities for Transfer and Sustainability of Effective Interventions

For more information on these activities, contact National Prevention Information Network (described below) at 1-800-458-5231.

Behavioral and Social Science Volunteer (BSSV) Project

The BSSV project is a technical assistance program implemented to link behavioral and social scientists with HIV prevention efforts in their communities. The program was developed in response to a growing recognition of the ways in which behavioral and social science theory, research, and methods can be used to assess community needs, prioritize interventions, and target prevention programs. A key aim of this program is to increase local capacity for selecting and using science-based prevention interventions.

Behavioral Intervention Training Program

This program is a component of the National STD/HIV Prevention Training Centers (PTCs) which were set up to help a diverse audience of health professionals develop skills in behavioral strategies to prevent or reduce behaviors that place persons at risk for sexually transmitted diseases/HIV infections. PTCs develop curricula and offer training on individual-, group- and community-level behavioral interventions; offer courses to meet specialized needs; and use distance-learning technologies as appropriate.

CDC National AIDS Hotline

The CDC National AIDS Hotline is a health information service developed to provide 24-hour bilingual and TDY services. The National AIDS Hotline services supply accurate, confidential information about HIV/AIDS and refer callers to other resources in their communities. Also, the hotline responds to requests for assistance, such as those from other hotlines and community-based AIDS service organizations. To promote consistency of information and services among all HIV/AIDS hotlines, the National AIDS Hotline takes the lead in providing forums for communication, including a national newsletter, e-mail information mailing lists, and chat-rooms.

CDC National Prevention Information Network (NPIN)

The National Prevention Information Network (NPIN) was established by CDC to develop or identify and collect information on the prevention, treatment, and control of HIV/AIDS, sexually transmitted diseases (STDs), and tuberculosis, and to disseminate this information to various audiences, including health care providers, patients, prevention researchers, grass-roots community organizations, and providers of support services.

Educator/Trainer Network (ETN)

The Educator/Trainer Network comprises HIV/AIDS prevention trainers and educators from public and private health organizations who meet annually to discuss issues of relevance and to share experiences and information. The ETN meetings present an opportunity for the trainers and educators to learn from one another and to advise CDC staff on the needs of their organizations and client groups.

Division of HIV/AIDS Prevention (DHAP) Web Site

The DHAP Web Site (http:/www.nchstp.cdc.gov/dhap/dhapinet.htm) was developed as an information source on HIV/AIDS prevention for the general public. It provides immediate access to resources such as publications, slide sets, software, training, basic statistics, and conference and funding opportunities.

HIV/AIDS Slide Sets

The HIV/AIDS slide sets are a series of 35-mm slides of current HIV/AIDS surveillance data, micrographs, and other HIV/AIDS-related images. Plans are under-way to expand the current series to include sets with a focus on prevention. The slide sets are developed for public health professionals, scientists, students, and the general public.

HIV/AIDS Voice Information System

The CDC Voice Information System is an automated telephone service (audiotext and fax-back system) that provides information on a variety of public health topics, including AIDS, to a wide range of audiences, including public health officials and other health practitioners. Callers can obtain information on a variety of HIV- related topics, including the latest statistical and epidemiologic data from the semiannual *HIV/AIDS Surveillance Report* and up-to-date information on HIV transmission and prevention.

National and Regional Minority Organization Program

The CDC-funded National and Regional Minority Organization Program is designed to strengthen HIV prevention activities among racial and ethnic minority organizations. About 22 National and Regional Minority Organizations are funded to provide technical assistance that is designed to be culturally appropriate and relevant to the minority groups served by or comprising the organization requesting assistance.

National Technical Assistance Providers' Network

The National Technical Assistance Providers' Network aims to ensure the provision of technical and program assistance and training to support HIV prevention community planning. The Network was designed to address specific goals, including (a) developing a better understanding of technical assistance needs, (b) improving access to a range of technical and organizational experts to meet these needs, and (c) helping to build relationships between project areas and assistance providers who understand the community and its prevention systems.

Public Health Conference Support

Conference support is administered as a cooperative agreement to provide partial support for specific nonfederal HIV prevention conferences on health promotion, disease prevention, information and education programs, and applied research.

Science, Evaluation, and Technology Transfer Team

The Science, Evaluation, and Technology Transfer (SETT) Team is an interdisciplinary team which offers technical assistance to CDC grantees on program development, implementation, and evaluation, and technology transfer. SETT team members together with CDC project officers review requests for technical assistance, assess technology transfer needs, and develop individualized plans.

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